«Sigrand» LLC

SHDSL modem «Sigrand SG-17B»

User's manual v. 3.5

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How to use this «Manual…»

To make this manual easier to use, the following icons and fonts are provided for:

Icons

Icon	Meaning	Explanation
	Take note of it!	A section of this manual marked with this icon can make it easier for you to set up and operate the device
	Important information	A paragraph marked with this icon contains an important information about specific features of a unit or program which is meant to save your time and effort when setting up the device
	Don’t do it!	This icon is to prevent you from taking any steps that can cause either a breakdown of the equipment or a danger to life

The use of fonts in the text

Designation	Explanation
`Image in the screen`	This font is used to show the contents of the terminal screen when you are setting up the modem.
Name of a key of the keyboard	This font is used to name the keys of the computer keyboard (e.g. **Enter**) which are used when setting up the modem through a terminal
Select *Properties* in the *File* menu	Fragments of the «Manual …» containing important information are printed in *italics* (combined with icons); also, *italics* is used for program menu buttons.
`stat`	The bold font is used to designate commands managing the modem through a terminal program.

➔ *Before you start setting up the modem, please visit our site www.sigrand.ru and see whether there is a new version of this «Manual …» or an update of the firmware and drivers.*

1. Description of the modem

Sigrand modems «SG-17B» are SHDSL-modems with Ethernet interface designed for integrating distributed local networks and connecting remote computers and devices that are supplied with Ethernet interface.

Feature of a number of modification modem (SG-17B-261, SG-17B-161) is the ability to obtain, and for modifications (SG-17B-441, SG-17B-351) the possibility of filing, remote powering through a SHDSL line (Power-over-DSL). Feature to obtain is available when the modem is used in combination with the following equipment produced by « Sigrand »:

- DSLAM SG-17S (with interface modules MS-17H4P2);
- Router SG-17R (with interface modules MR-17H1P2 and MR-17H2P2);
- Regenerators SG-17E2P-SLG;
- Modems modifications SG-17B-441, SG-17B-351;

Modems SG-17B-111, SG-17B-121, and SG-17B-141 are powered from a local power source with voltage 3.3, 12, or 48 V - in this case, SG-17B modems can be operated in combination with Sigrand non-function of the remote powering:

- DSLAM SG-17S (with interface modules MS-17H4);
- Router SG-17R (with interface modules MR-17H1 and MR-17H2);
- Modems SG-17B of various modifications.

Ethernet interface of modems SG-17B-541 and SG-17B-261 allows connection of devices powered through Power-over-Ethernet technology (IEEE 802.3af standard, Class2). Also modems modification SG-17B-151 and SG-17B-351 can be powered by technology Power-over-Ethernet (IEEE 802.3af standard, Class1, Class3).
A full list of modification series modem Sigrand SG-17B is shown in table 2 (page 11).

The interface of SHDSL modem complies with ITU-T G.991.2.bis version (the version of 2005) and uses the TCPAM – Trellis-Coded Pulse Amplitude Modulation encoding set for data transfer.

The modem is equipped with the following interfaces:

- one SHDSL interface (ITU-T G.991.2.bis standard) operating in the bitrate range 192-15296 Kb per second;.
- one Ethernet interface 10/100Mb (IEEE 802.3) with the options of automatic rate adjustment and auto-sensing MDI/MDI-X;
- one USB interface for managing the modem.

1.1. Characteristics of the linear DSL interface

Connection type	point-to-point
The number of wires in the communication line	2 (one pair)
Type of the cable	ТПП, КСПП, UTP
Linear code	TCPAM
Input and output resistance, Ohm	135
Bitrate range of data transfer, Kb per second	192-15296
Step of bitrate change, Kb per second	64
Type of communication	full-duplex
Mode of data transfer	synchronous, packeted
Packet format	HDLC
Checksum	CRC32
Type of socket	2EDGR-5.08-03P
Breakdown voltage of the galvanic isolation transformer, not less than, V	1500
Arrester response voltage (differential), V	30
Breakdown voltage of the surge arrester (phase-locked), V	350

1.1.1. Communication range and bitrate of Sigrand modems

Brief information on communication range and bitrate of Sigrand SG-17B modems is given in Table 1. The results were obtained with the length of lines providing the value of Bit Error Rate (BER) equal or less than 10^{-7}. The specified value of communication range is proved experimentally at the test communication line of Sigrand Laboratory. The complete Table of bitrates is shown at www.sigrand.com. The actual results shown at a real communication line may differ from the specified values because of possible diversities in the parameters of the lines.

Table 1

Bitrate (Kb per second)	Linear code	Parameter	Cable ТПП100-0.5
15296	TCPAM128	Length (km)	**0,6**
		R (Ohm)	150
10240	TCPAM64	Length (km)	**1,8**
		R (Ohm)	324
7168	TCPAM64	Length (km)	**2.8**
		R (Ohm)	504
5696	TCPAM32	Length (km)	**3.4**
		R (Ohm)	612
3072	TCPAM16	Length (km)	**5**
		R (Ohm)	900
2304	TCPAM16	Length (km)	**5.4**
		R (Ohm)	972
1024	TCPAM16	Length (km)	**7.8**
		R (Ohm)	1404
512	TCPAM16	Length (km)	**9.0**
		R (Ohm)	1800

The actual bitrate range may happen to be limited with 5.7 Mb per second in case the modems are used in combination with some types of interfaces issued before 2009 which have bitrate limitations.

1.2. Characteristics of the Ethernet interface

Type of the interface	10/100 Base-T
The number of ports	1
Bitrate, Mb per second	10/100
Mode of operation	Half- and full-duplex
Compatibility	ANSI/IEEE Std 802.3
Auto-sensing MDI/MDI-X	Available

1.3. Characteristics of the USB interface

Type of the interface	USB
The number of ports	1

USB interface at the modem operate in a USB Serial Port mode
USB Serial Port settings:

Bitrate, b per second	115 200 or 9600
Protocol	8-N-1
Flow control	absent

The bitrate of USB Serial Port depends on the version of the embedded software. By default, software supporting bitrate of 115200 b per second is installed.

1.4. Power

Modem series Sigrand SG-17B has modification with different type of power – ~220В, PoE receipt and delivery, a wide range of DC voltage: 12V, 24V, 48V and modification of the issuing and receiving the remote powering through a DSL line (Table 2).

Table 2

modification	type of modem power					output voltage			execution	
	220V AC	9,2…15 V DC	18…72V DC	48V DC (PoE)	120…240V DC (PoDSL)	PoE	48 (до 10 Вт)	PoDSL (240V DC)	sealed IP66	mounting on DIN-rail
SG-17B-111	*								option	option
SG-17B-121		*							option	
SG-17B-141			*						option	
SG-17B-541			48			Class 2			option	
SG-17B-161					*				option	
SG-17B-261					*	Class 2	*		option	
SG-17B-151				Class 1					option	
SG-17B-441			48					*	option	
SG-17B-351				Class 3				*	option	

SG-17B-***IPE*** where:

I – interface (1 - one Ethernet an one SHDSL; 2 – one Ethernet PoE output and one SHDSL PoDSL input; 3 – one Ethernet PoE input and one SHDSL PoDSL output; 4 – one Ethernet PoE output and one SHDSL).

P – power (1 – 3,3V; 2 – 12V; 3 – 24V; 4 – 48V; 5 – 48V PoE; 6 – 240V PoDSL).

E – enclosure (1 – indoor case; 2 – IP66 case; 4 – indoor case with mounting on DIN-rail; 5 – IP66 case with mounting on DIN-rail;)

With a maximum load of PoDSL (17W) for SG-17B-351 modem power consumption is about 20 W, which corresponds to the class of consumption PoE +

1.4.1. Remote power Power-over-DSL (PoDSL)

Remote power (PoDSL):

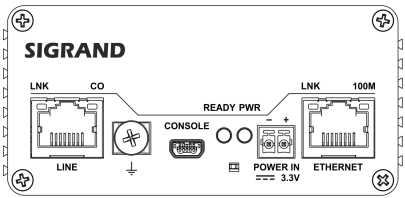
Voltage, DC V	240
Current, mA	70
Output power, W	17

Remote powering of the modem is carried through a DSL signal line.
For the modems which has ability to obtain remote power, on the opposite side of the DSL line must be installed equipment supporting the power supply through the line. (see Section 1, p.7 of this Manual).
Modems which supply feeding to the DSL line, powered either locally on the voltage 48V DC or technology Power-Over-Ethernet (paragraph 1.4.4).

1.4.2. Local powering of the modem

Local powering of the modem is carried out from a local constant-current power source through the socket "**POWER IN**" (Fig. 1). There are four modifications of the modem that provide for local powering: for 12, 24 and 48 Volt and ~220V. The mating connector is included in the delivery set. When hooking up, the electric polarity should be taken into account (Fig. 1).

Figure 1



Failure to comply with the polarity when hooking up a local power source will cause actuation of power protection.

1.4.3. Through-line powering

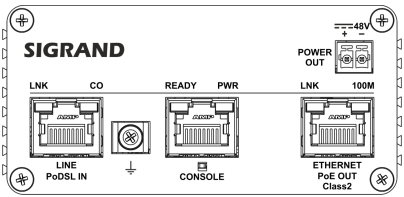
Through-line powering of the modem is carried out through a remote power system. The socket "**POWER OUT**" (Fig. 2) is used for powering the

devices located at the site of the modem installation, for instance, video-camera backlighting devices or thermo-elements of outdoor housings. Also, through-line powering can be used to feed devices that are not supplied with Power-over-Ethernet system.

The voltage of through-line powering is constant-current 48 Volt. The capacity of the devices hooked up through the system of through-line powering (for SG-17B-261 modem, the total of the capacities of the devices hooked up through the system of through-line powering and PoE) must not exceed 10 watt. The socket arrangement and the polarity are shown in Fig. 3.

When hooking up equipment through the system of through-line powering need to make a preliminary calculation of the power consumption of connected devices. When connected to equipment in excess of the allowable values of power - protection will overload.

Figure 2



1.4.4. Power-over-Ethernet powering of the equipment

Modems SG-17B-541 and SG-17B-261 can be used to feed equipment connected up to them by means of Power-over-Ethernet Class 2 technology (capacity up to 10 Watt).
In this case, powering is carried out through the version “B” (Table 3) via spare wire pairs.

Table 3

Contacts of the **ETHERNET** socket	Function	
	DATA	POWER
1	Tranceive DATA+	
2	Tranceive DATA-	
3	Receive DATA+	
4		Positive VPort (+U)

5		Positive VPort (+U)
6	Receive DATA-	
7		Negative VPort (-U)
8		Negative VPort (-U)

Modem modification SG-17B-151 is powered using PoE technology, power consumption corresponds to the class of consumption – Class1 (up to 5 Watt, according to the standard IEEE 802.3af)
Modem modification SG-17B-351 also powered using PoE technology, since this modification has the function of supply power over DSL line PoDSL, power consumption is a modem for PoE corresponds to the class of consumption - Class3 or PoE+ (to depend on the load PoDSL). At the maximum consumption by PoDSL (17W), consumption modem through PoE will be about 20 W, which corresponds to the class of consumption PoE+.
Modem power SG-17B-151 and SG-17B-351 for option "A" and "B" standard IEEE 802.3af.

1.5. Other information

External dimensions of the modem case indoor:

- height, mm 44
- width, mm 93
- full length, mm 63
- length if the box, mm 62

Power consumption, W Not more 3.6

External dimensions of the modem case outdoor:

- height, mm 44
- width, mm 93
- full length, mm 115
- length of the box, mm 88

Power consumption, W Not more 3.6

1.6. Scope of delivery

Modem	1 item
Power supply unit	1 item
Socket for connecting a DSL line	1 item
USB cable	1 item
Wrapping	1 item

Power supply unit is only delivered with SG-17B-111 modems and it is an AC/DC adapter of the following characteristics: input voltage 100-240 VAC; output voltage 3.3 VDC.

1.7. Operating conditions

The modem is designed to operate in the following environmental conditions:

Indoor case:	
ambient temperature	-35 .. 40º C
relative air humidity	to 85 %
Outdoor case:	
ambient temperature	-35 .. 40º C
relative air humidity	to 97 %
atmospheric pressure	84 .. 107 KPa
MTBF	45000 h.

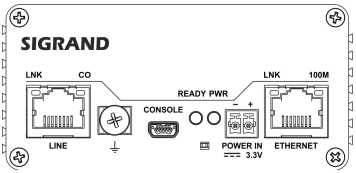
1.8. Appearance and functions of indicators and sockets

Modem series Sigrand SG-17B is available in rectangular metal case, indoor and outdoor sealed. All sockets and indicators are located at the one side of the modem.

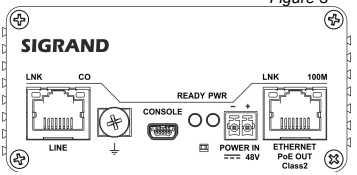
1.8.1. Indicators and sockets indoor case

On the front panel of modem in the indoor case Fig. 3 there is sockets for interfaces: SHDSL, USB , Ethernet, ground connection, as well as LEDs indicate the status of the device. Panel with connectors and indicators vary depending on the modification of the modem Fig. 3.

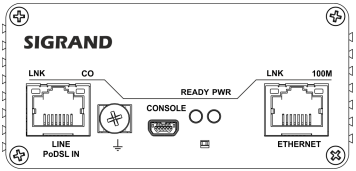
Figure 3



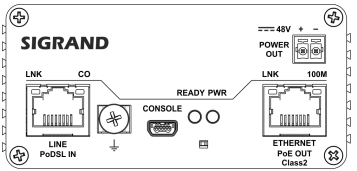
Modems SG-17B-111, SG-17B-121, SG-17B-141



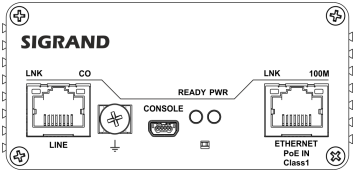
Modem SG-17B-541



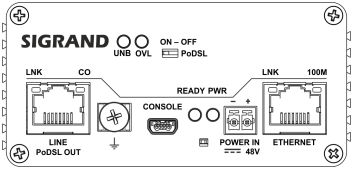
Modem SG-17B-161



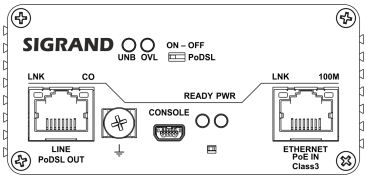
Modem SG-17B-261



Modem SG-17B-151



Modem SG-17B-441



Modem SG-17B-351

Appointment sockets and switch in modem SG-17B.

Table 4

LINE	DSL interface socket
ETHERNET	Ethernet interface socket 10/100Base-T
CONSOLE	Control port socket USB
POWER IN	Local powering socket
POWER OUT	Through-line powering socket
⏚	Ground connector

Switch "PoDSL" Fig. 4 controls the remote power supply to the line DSL. For the supply remote power to the line should change the selector to "ON".

Figure 4

Supply remote power to the line should be only after the connection DSL line

Functions of Sigrand SG-17B indicators are shown in Table 5.

Table 5

Indicator	State	Meaning
POWER		
PWR	Lighted	The modem is on
	Not Lighted	The modem is off
READY	Lighted	The modem is ready to work
	Not Lighted*	The modem is not ready to work
ETHERNET		
LINK	Lighted	The modem is connected to an Ethernet
	Not Lighted	The modem is connected to an Ethernet
	Flashing	Data is exchanged via Ethernet
100M	Lighted**	The modem is connected to 100Base-TX network
	Not Lighted**	The modem is connected to 10Base-TX network
DSL		
LINK	Lighted	DSL connection is established
	Flashing	DSL connection is being established
	Not Lighted	DSL connection is not established
CO	Lighted	Modem operate in master (CO) mode
	Not Lighted	Modem operate in slave (CPE) mode
PoDSL (only for modification modems: SG-17B-441 и SG-17B-351)		
UNB	Lighted***	Upset the balance
	Not Lighted	Operate normally
OVL	Lighted	Overload source PoDSL
	Not Lighted	Operate normally

If the **Ready indicator is not lighted after 1 – 2 minutes after turning on the modem, it is mean that modem not is working properly.*

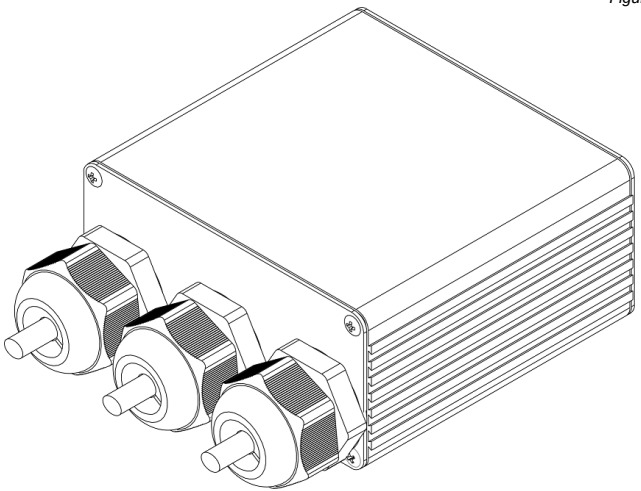
***Indicator **100M** relevant only when the indicator **LINK** is lighted or flashing.*

****Unbalanced remote power to the ground. Normally on one wire plus 120 on the other - minus 120 V. If there is more bias of 30 V, indicator lights UNB. Cause misalignment may be leaking or the closure of one of the wires on the "ground."*

1.8.2. Indicators and sockets outdoor case

On the front panel of the modem in an outdoor case (Fig. 5) there are three cable glands, which allows to make a connection to the interfaces SHDSL, USB and Ethernet.
For the initial setup and connect the modem allowed delete a panel with the cable glands.
The internal layout of connectors and indicators modem in an outdoor case, fit the description given in section 1.8.1..

Figure 5



2. Setting up the modem for operation

Sigrand SG-17B modems are set up through the serial control port "**Console**" (interface USB) (Fig. 4).
It is provided for in the SHDSL standard that one of the linked modems acts as the «master» modem for which all the communications parameters are adjusted and the other acts as a «slave».
The state of a modem can be changed manually through the terminal program of modem management (see Section 3.3.1).

2.1. Connecting the modem to the cable

Make sure that the allotted communication line does not have any foreign electrical sources and is not hooked up to any foreign PABX equipment! Failure to observe this rule may cause a breakdown both in the modems and in the foreign equipment on the communication line!

Make sure that there are no thermal switches in the line. They will limit the speed of modem operation.

2.1.1. Specific features of connecting the modem to a PoDSL line

With SG-17B-161 and SG-17B-261 modems, it is permissible to hook them up to a DSL line with voltage already fed there from a Sigrand device:

- SG-17S with MS-17H4P2 modules;
- SG-17R with modules MR-17H1P2 or MR-17H2P2;
- SG-17E2P-SLG.

When connecting the modem to a DSL line it is recommended that all the equipment which is fed via through-line powering system or PoE should be disconnected from the modem. This equipment is to be hooked up only after the communication between the modem and the remote device is established.

2.1.2. Requirements for the communication line

To ensure normal operation of the modems and the specified values of the performance characteristics, the line must meet the following requirements:

- The cable must have neither core-to-core bridges nor ground leakages, or leakages to other conductors including those not hooked up to anything. The line must not have branches.
- Cores of a multi-pair cable must be taken from the same pair.
- Parallel connection of several pairs (for instance, in order to reduce the active resistance) is not permissible.
- Failure to meet the above requirements may cause degradation of the characteristics or even complete disability of the line.
- Using modems in either aerial or combined (underground+aerial) lines **is forbidden**.

Warranty will become null for the modems operated at aerial or combined (underground+aerial) lines.

After you have made sure that the communication line meets the above requirements, take the following steps:

- Place the RJ-45 plug on the cable, according to (Fig. 7). Modem Sigrand SG-17B uses only one pair of wires, pins 4 and 5, the other pins are not used..
- Connect the cable socket to the DSL socket of the modem.

Figure 7

plug connector socket connector

3. Management of the modem

Sigrand SG-17B modems are managed through the control port «**CONSOLE**» (Fig. 4) by means of USB interface, through a computer where terminal software is installed.

3.1. How to link-up and set-up a terminal

To set up a modem, its control port «**CONSOLE**» is to be connected to the USB port of the computer. In the first connect you must wait until the driver installation in Windows and Linux OS installation is fully automated. If for some reason the automatic installation is not available, download the driver at www.sigrand.com. After installing the driver, the modem will be presented to the OS as a USB Serial Port. The USB Serial Port of the computer is adjusted according to Section 1.3 of this Manual. With OS Windows, it is recommended that terminal program «HyperTerminal» should be used and with OS Linux, terminal program «Minicom» is suitable.
It is also acceptable to use cable adapters "Com <–> USB"; in this case, the instruction for adjusting the adapter is given in the accompanying documentation for the cable adapter.

3.2. Control commands

The modem is managed with a set of commands falling into two groups: «general purpose» commands for managing the modem (**`help, info, reboot`**) and commands for managing the interfaces (**`rate, tcpam`** etc.).
The facilities of management from a terminal allow setting the mode of operation of the modem's linear interface, monitoring the state of interfaces etc. Using the **`help`** command will produce a description of the main managing possibilities:

```
> help

*****************************Help menu*******************************
master | slave              - set modem mode: master(CO) or slave(CPE)
annexA|B                    - G.SHDSL.bis Annex type
tcpamXXX                    - line coding, XXX={16,32,64,128}
rate <value>                - line rate
plesio | plesio-ref | sync  - Plesiochronous/Plesio-Ref/Synchronous
                              modes
```

```
pbo-normal|pbo-forced <val> - Power Backoff mode, <val> - value in dB
cfg                          - Inquiry configuration
stat                         - Inquiry statistic
info                         - Info modems
reboot                       - Reboot modems
retrain                      - Retrain links
default                     - Default settings
ETHERNET settings:
eth                          - Ethernet settings
eth <argument list>          - Setup ethernet
Argument list:
100 | 10                     - 100 or 10 Mbit/s
full | half                  - Full or Half duplex
auto | /auto                 - Enable or Disable Auto negotiation
Examples: "eth 100 full", "eth auto", "eth /auto"
**************************************************************************
```

The **`info`** command will show the information on the version of the embedded software:

```
> info
Sigrand SG-17BT v. 1.0
Firmware MC: SG-17BT v.1.0
Firmware IDC: v1.1_1.4.18
Firmware SDFE: v11.158.003
Firmware IAP: v1.0 UART
>
```

The **`reboot`** command is used for restarting the modem:

```
> reboot
Sigrand SG-17BT v.1.0
Firmware version: SG-17BT v.1.0
Initialization.....
Initialization complete
Configuration......
Configuration complete
```

When an invalid command is entered, the following message appears (for instance, suppose "**`sdf`**" is entered):

```
> sdf
Command not found: sdf
>
```

3.3. Management of the DSL interface

DSL interface is adjusting by use of the following commands:

```
master | slave           - set modem mode: master(CO) or slave(CPE)
annexA|B                 - G.SHDSL.bis Annex type
tcpamXXX                 - line coding, XXX={16,32,64,128}
rate <value>             - line rate
plesio | plesio-ref|sync - Plesiochronous/Plesio-Ref/Synchronous modes
pbo-normal|pbo-forced<val> - Power Backoff mode, <val> - value in dB
```

3.3.1. Choosing between the «master»/«slave» options

For operation in the communication line, the given pair of modems is to be arranged as follows: one of the modems is to be selected as the «master» and the other as a «slave». The arrangement is performed via commands **`master`** or **`slave`**, respectively.

```
> master
Configuration......
Configuration complete
>
```

```
> slave
Configuration......
Configuration complete
>
```

It is recommended that the modem which is easier available for managing, adjusting and maintaining, should be selected as «Master».

3.3.2. Adjusting the DSL interface rate

The speed of connection is only to be set at the «Master» modem whereas the «Slave» will be automatically adjusted in correspondence with the settings of the «Master».

To make the optimal choice for the bitrate, the parameters of the line intended for the modems are to be taken into account. In case the line parameters are unknown, the following procedure is recommended to choose the bitrate:

- Measure the line resistance with an ohmmeter (at one side, the wire pair is short-circuited and at the other side the measurement is carried out) and use Table 2 of Appendix to define the bitrate range within which the connection is going to be robust.
- The bitrate value is set via the command **`rate`** and the parameter **`<value>`** where **`<value>`** is the bitrate measured in Kb per second. The bitrate value can be established with a step of 64 Kb per second, in the range 192 to 15296 Kb per second.

```
> rate 15296
Configuration......
Configuration complete
>
```

- When being a «Slave», the modem receives the values of bitrate and linear coding from the «Master», through the standard G.hs Preactivation (ITU-T G.994.1).
- The process of establishing the connection will take 2-3 minutes. 3 attempts at establishing a connection are allowed.
- If after the specified period of time the modems are not connected (the light-emitting diode «DSL LINK» does not flash on), select a lesser bitrate and try again with the new bitrate value.

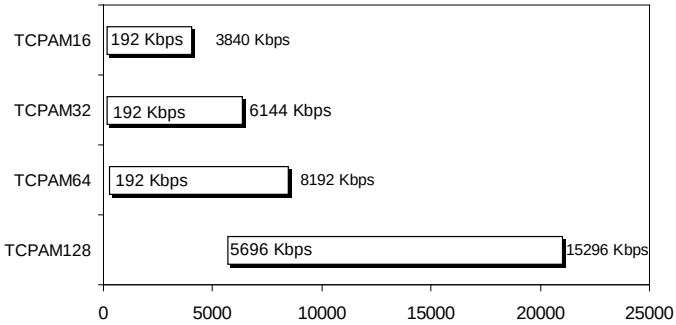
3.3.3. Choosing the linear encryption

TCPAM encoding, used by modems for the transmission of G.991.2 standard, has several grades of the encryption algorithm complexity. With high bitrates, versions with a greater number of modulation positions are used (TCPAM64, TCPAM128) and with lower bitrates, modes with lesser numbers of modulation positions (TCPAM16, TCPAM32) are applicable. Also, with the increase of the encryption algorithm complexity, noise Immunity of the channel decreases, and vice versa.

Therefore, when setting up the bitrate of the communication line, special attention should be paid to the encryption algorithm TCPAM and, when necessary, the linear coding should be altered in order to produce the best possible results.

In diagram 1, the permissible ranges of TCPAM encodings are shown.

Diagram 1



In order to adjust the encryption mode so as to suit the actual characteristics of the specific line, the command **`tcpamXXX`** can be used with the option **XXX,** where «XXX» stands for one of the 4 encoding types (TCPAM128, TCPAM64, TCPAM32, and TCPAM16).

```
> tcpam128
Configuration......
Configuration complete
>
```

➔ *As can be seen from Diagram 1, some of the bitrate ranges allow for several modes of encoding. When the noise level is high in the communication line, encodings of lesser number of positions should be chosen (TCPAM16, TCPAM32); when the bandwidth is limited, those with greater number of positions (TCPAM64, TCPAM128) are preferable.*

When a linear encoding is entered for a bitrate which is outside the permissible bitrate range, a message appears informing about encodings recommended for this specific bitrate.

3.3.4. Adjusting the auxiliary DSL parameters.

The commands **plesio, plesio-ref, sync** are used to set up the mode of synchronizing modems.
In case the communication route is formed of modems Sg-17B<->Sg-17B, the mode of synchronization «**sync»** is recommended. Otherwise, modes «**plesio»** or «**plesio-ref»** are preferable, the choice being determined for each specific communication line empirically.
For a DSL line, it is possible to set the level of signal power backoff in decibels (dB), by use of the command **pbo-forced** with the parameter **<val>** where **<val>** is the level of power backoff within the range 0 to 30.
The command **pbo-normal** is used to establish the automatic mode of signal power backoff in the communication line.

➔ All the above commands can be either used separately or united into a single line, for example:

```
> master annexA  tcpam128  rate 14080 sync pbo-normal
```

3.3.5. Review of the current configuration of the SHDSL interface

The command **cfg** can be used to review the current configuration of the modem.

```
> cfg
Current configuration:
master Annex A TCPAM128 sync rate=15296 pbo-normal
>
```

3.3.6. Statistics of the SHDSL connection

To review the statistics of the connection, the command **`stat`** is used:

```
> stat

dsl_link: online
SNR_Margin 19dB, Loop Attenuation 1dB, pbo_Value 6
ES_count 0, SES_count 0, CRC_Anomaly_count 0, LOSWS_count 0,
UAS_count 0, Loss_count 0
```

- **SNR_Margin** – signal/noise proportion in the line (dB);
- **Lopp Attenuation**– level of signal attenuation in the line (dB);
- **Power Backoff** – level of power backoff in the line (dB);
- **ES_count** – the number of one-second intervals during which either at least one CRC abnormality was detected, or more than one LOSW errors;
- **SES_count** – the number of one-second intervals during which either at least 50 CRC abnormalities occurred or more than one LOSW errors (for standard frame length, 50 CRC abnormalities during one second correspond to 30% of invalid frames);
- **CRC_Anomaly_count** – the number of CRC abnormalities detected during the period of monitoring;
- **LOSWS_count** – the number of one-second intervals during which more than one LOSW errors were detected;
- **UAS_count** – the number of one-second intervals during which the SHDSL channel was not available. After a failure, the channel is considered available when no SES occurred during 10 seconds. These 10 seconds are not counted as those during which the channel was not available.

After each enquiry, the statistics is reset.

3.3.7. Resetting the connection

This command cuts the current DSL connection and initializes a new one. Initialization of a new connection is defined by the option **retrain**:

```
> retrain
```

3.4. Adjusting the Ethernet interface

Sigrand SG-17B modems are equipped with a 10/100M Ethernet port, with the option of auto-sensing MDI/MDI-X. By default, the Ethernet port is arranged in the «auto» mode – with automatic speed/duplex adjusting.
If necessary, these parameters can be set manually:

```
ETHERNET settings:
eth                          - Ethernet settings
eth <argument list>          - Setup ethernet
Argument list:
100 | 10                     - 100 or 10 Mbit/s
full | half                  - Full or Half duplex
auto | /auto                 - Enable or Disable Auto negotiation
Examples: "eth 100 full", "eth auto", "eth /auto"
```

3.5. PoDSL and PoE modes

PoDSL and PoE powering is managed automatically. No menu settings are provided for managing these systems.

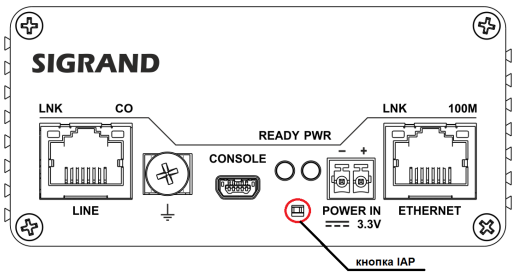
4. Updating the embedded software of the modem

Updating the embedded software (firmware) of a Sigrand SG-17B modem, as well as its managing, is carried out by means of a terminal program.

To initialize the process of updating the firmware, the following steps should be taken:

- Disconnect the modem from the power source.
- Connect the modem's control port «**CONSOLE**» (Fig. 7) to the USB port of the computer.
- Start the terminal program chosen in accordance with Section 1.3 of this manual at the computer.
- Press the button "IAP" on the front panel of the modem (Fig. 7).
- Keeping the button pressed, feed the power to the modem.

Figure 7



In case the sequence of steps and the terminal settings were both correct, a message will appear on the screen:

```
********ROGRAM UPDATE************************
 Download To Internal Flash ---------------- 1
 Download To External Flash SDFE Infineon--- 2
 Download To External Flash IDC Infineon---- 3
 Jump New Program ------------------------- 4
*********************************************************
```

After this menu is displayed on the screen, the button should be released. To update the embedded software (firmware) of the microcontroller, you are to enter «1». Software for a microcontroller is available at the site www.sigrand.com .

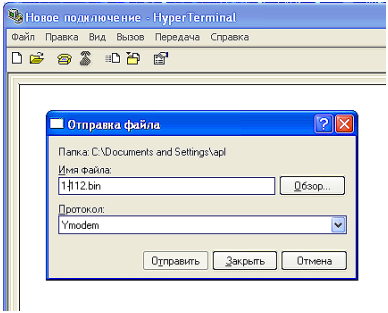
In case it is necessary to update the firmware of the SHDSL chip, «2» or «3» should be entered. The update for a SHDSL chip consists of two firmware files with the extension «.bin », and is only available upon request to the «Sigrand» company.

After «1», «2», or «3» is entered, a message appears with a request for permission for loading the image-file:

```
Waiting for the file (press 'a' to abort )
CCCCCCC_
```

After that, you are to choose the item «send file» in the menu «transfer» of the terminal program. A window of sending file will appear (Fig. 8); in its «Protocol» field, you are to choose the «Y-Modem» transmission protocol (here, the example of HyperTerminal from the standard OS Windows delivery set is taken).

Figure 8



Then the location of the image-file aimed for updating the modem's firmware should be specified. The form of an image-file is «*.bin». A firmware can contain several image-files.
The process of updating is to be initiated for each file separately. The order of updating files is arbitrary.
After the firmware is loaded, the following message appears:

```
        Download Completed Successfully
*********************************************
              Name: sg17e01.bin
              Size: 8468 Bytes
*********************************************
**************** PROGRAM UPDATE**************
 Download To Internal Flash --------------- 1
 Download To Internal Flash SDFE Infineon-- 2
 Download To Internal Flash IDC Infineon--- 3
 Jump New Program ------------------------- 4
*********************************************
```

Now, the option **"4"** is to be selected, and the modem will switch from the mode of updating firmware to the standard operating mode.

Guaranty and warranties

The manufacturer guarantees the operability of the modem provided that the user observes the operating instructions.
The warranty period is not less than 5 years starting with the day of purchase as specified in the certificate, or, in case no mark of purchase is made, starting with the day of issue as specified in the identification mark.

Warranty limitations :
Warranty will become null for modems operated at «aerial» or combined («underground+aerial») lines.

Manufacturer's address:
Av. Lavrentyeva, 6/6,
Novosibirsk, Russian Federation,
«Sigrand» LLC

Tel.: (8-383) 332-94-37
Fax: (8-383) 332-02-43
www.sigrand.com

WARRANTY CARD

for modem «Sigrand SG-17B»

Serial № _____

Modification modem _____

produced in «____»_____20___.

Checked by _____/_____/

locus sigilli

Vendor	
Address	
Telephone	
Date of purchase	
locus sigilli	
Signature	

Buyer	
Address	
Telephone	
Date of purchase	
locus sigilli	
Signature	

Appendix A

Main characteristics of «TPP» cable

Table A.1.
Frequency dependences for parameters of a twisted-pair cable with copper cores and polyethylene insulation (cables of «TP» type)

f, KHz	Primary parameters			Secondary parameters	
	R~, Ohm/km	L, H/km *10^{-4}	G, S/km *10^{-4}	|Z|, Ohm	α, dB/km
Core diameter: 0.4 mm					
20	278	5.51	1.13	225.2	6.81
50	280	5.51	4.24	152.6	9.12
100	283	5.50	11.3	125.7	10.3
250	316	5.46	42.2	113.7	12.2
500	394	5.35	120	110.5	15.6
700	455	5.26	188	109.1	18.2
1000	535	5.15	305	107.7	21.7
Core diameter: 0.5 mm					
20	181	5.50	1.13	185.1	5.15
50	182	5.50	4.24	133.3	6.48
100	189	5.49	11.3	118.0	7.17
250	234	5.40	42.2	111.6	9.21
500	310	5.23	120	108.8	12.4
700	361	5.26	188	107.4	14.6
1000	424	5.04	305	106.3	17.2

Table A.2. Loop resistance of the cable as depending on the core diameter:

Core diameter (mm)	Loop resistance (Ohm/km)
0.32	432
0.4	278
0.5	180
0.64	110